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Impact of Depression and Anxiety on Sexual Functioning in Couples Trying to Conceive With and Without an Infertility Diagnosis

Joana Fátima Gonçalves Fernandes

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IMPACT OF DEPRESSION AND ANXIETY ON SEXUAL FUNCTIONING IN COUPLES TRYING TO CONCEIVE WITH AND WITHOUT AN INFERTILITY DIAGNOSIS

Joana Fátima Gonçalves Fernandes

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DEDICATÓRIA

Para ti,

Por me teres segurado no meio da tempestade,

Com aquele abraço de sonho que se tornou em realidade.

Por nunca me teres deixado sentir sozinha,

Com aquela luz de amor que reanimava a minha vida.

Por nunca teres partido,

Mesmo depois da tua despedida.

AVISOS LEGAIS

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Esta dissertação é apresentada em formato de artigo científico na língua inglesa, com o objetivo de submeter uma versão a uma revista científica indexada.

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Resumo

A depressão e a ansiedade estão significativamente associadas a vários aspetos da vivência de barreiras à fertilidade e da sexualidade. Contudo, existe pouca evidência acerca do impacto dos sintomas psicológicos no funcionamento sexual no âmbito da infertilidade, tendo o casal como unidade de análise. Este é o primeiro estudo a investigar efeitos de moderação do conhecimento de um diagnóstico de infertilidade entre a sintomatologia depressiva e ansiosa e o funcionamento sexual, quer no próprio quer no parceiro. Uma amostra de 107 casais a tentar conceber foi dividida em dois grupos: 63 casais com diagnóstico de infertilidade e 44 casais sem diagnóstico. Os participantes responderam a um questionário online, que incluiu as escalas *International Index of Erectile Function* (*IIEF*), *Female Sexual Function Index* (*FSFI*) e *Hospital Anxiety and Depression Scale* (*HADS*). Os resultados não revelaram diferenças significativas quanto à ansiedade, depressão e funcionamento sexual, com exceção do desejo sexual masculino que se manifestou inferior nos casais inférteis. Os resultados APIM por sua vez evidenciaram um efeito moderador do conhecimento do diagnóstico na relação entre sintomatologia depressiva masculina e funcionamento sexual masculino, enfatizando uma diminuição do funcionamento sexual nos homens inférteis com valores elevados de depressão. Por outro lado, a depressão da mulher revelou-se associada a uma diminuição do seu próprio funcionamento sexual, em ambos os grupos. Concluiu-se que o diagnóstico de infertilidade desempenha um papel fundamental na relação da sintomatologia depressiva e o funcionamento sexual masculino. Estes resultados reforçam a necessidade de envolver o parceiro masculino durante o processo de tratamento e em acompanhamento psicológico.

Palavras-chave: infertilidade, funcionamento sexual, FSFI, IIEF, depressão, ansiedade, HADS, APIM

Abstract

Depression and anxiety are significantly associated with several aspects of facing infertility and of sexuality. However, there are few studies examining the impact of psychological symptoms on sexual functioning in infertility using couples as the unit of analysis. This study is the first to investigate actor and partner effects of depression and anxiety on sexual functioning, moderated by having knowledge of the infertility diagnosis. A sample of 107 couples trying to conceive was invited to participate in the study. 63 couples were assigned to group 1 (couples with infertility diagnosis) and 44 to group 2 (not diagnosed couples). The data was based on an online survey measuring *International Index of Erectile Function* (*IIEF*), *Female Sexual Function Index* (*FSFI*) and *Hospital Anxiety and Depression Scale* (*HADS*). Different analyses were conducted to better understand the relation between infertility, psychological symptoms, and sexual functioning, and an *Actor-Partner Interdependence Moderation Model* was used to examine the couple as the unit of analysis. No differences regarding psychological and sexual functioning were found between groups, except for sexual desire, which was lower in infertile men. APIM findings suggest a moderating effect of an infertility diagnosis between male depression and male sexual functioning, revealing a decreased sexual functioning in the presence of depression in infertile men. Women's depression was related to a decrease in female sexual functioning. In conclusion, receiving an infertility diagnosis might play a key role in male sexual functioning in the presence of depression. The findings reinforce the need for the male partner's involvement throughout the treatment process and infertility counseling.

Keywords: infertility, sexual functioning, FSFI, IIEF, depression, anxiety, HADS, APIM

Introduction

Infertility is defined by the World Health Organization as a medical condition of the reproductive system characterized by the couples' failure to establish a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (Zegers-Hochschild et al., 2017). However, immediate attention must be given if any risk factor for infertility is present, such as advanced female age (Sharlip et al., 2002). For this reason, health professionals recommend evaluation and treatment after 6 months of unprotected regular intercourse without conception in women with ages equal or over 35 years old (Johnson et al., 2012; Practice Committee of the American Society for Reproductive Medicine, 2008).

The inability to have a child affects 9% of couples across the globe (Bovin, Bunting, Collins, & Nygren, 2007), but the reported number of infertile couples seems to be increasing. In 1990, an estimated 42.0 million couples worldwide experienced infertility, while in 2010 the values rose to 48.5 million (Mascarenhas, Flaxman, Boerma, Vanderpoel, & Stevens, 2012). The prevalence of infertility in reproductive-aged women varies widely. In developed countries, infertility rates were estimated at 9%, while in developing countries they varied between 5 and 15% (Bovin et al., 2007). In some regions of the world, including Eastern Europe, infertility rates may be 30% of the couples (Mascarenhas et al., 2012). In Portugal, an epidemiology study indicated that approximately 10% of couples face difficulties to conceive (Silva-Carvalho & Santos, 2009). Due to the different methodologies, including different definitions for infertility, the studies estimating the prevalence of infertility show inconsistent results. However, research has consistently shown that secondary infertility, that is, when there is previous history of successful pregnancy, is more common than primary infertility (Mascarenhas et al., 2012).

Infertility has a considerable impact on an individual's quality of life, in conjunction with sex life, couples' relationship, relationship with family and friends, financial stability and others. Many people characterized infertility as a life crisis and it is associated with anxiety, guilt, feelings of inadequacy, diminished self-esteem, and depression (Rooney & Domar, 2012).

Additionally, an infertility diagnosis can be a stressful event which, in response, may cause sexual problems (Saleh, Ranga, Raina, Nelson, & Agarwal, 2003). The pressure of needing to have sex at specified times can undermine the spontaneity of sex, which becomes "mechanic" and diminishes intimacy, which in turn may have a disruptive influence on sexual functioning (Czyżkowska, Awruk, & Janowski, 2016; Wischmann, 2010). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*, American Psychiatric Association, 2014) uses a broadly classificatory scheme of sexual dysfunction based on the normal human sexual response cycle. Because all aspects are connected, disorders can occur at one or more of the four phases of the cycle: desire, arousal, orgasm and resolution (Kaplan, 1979), and they can arise from physical conditions and psychological factors (Baldwin, 2001). The studies have been contradictory in what concerns sexual functioning in infertile individuals. Millheiser and colleagues (2010), for example, have shown a decline in sexual satisfaction in infertile women, when values pre-diagnosis were similar to those of the control group. This finding is in accordance with Czyżkowska and collaborators (2016), who compared sexual and dyadic functioning using as criteria a confirmed infertility diagnosis, done by a gynecologist. Results revealed an elevated risk of sexual dysfunctions, lower levels of sexual satisfaction (physical satisfaction, emotional satisfaction, and satisfaction with control) and less sexual reactivity in infertile women, as compared to fertile ones. Contrarily, a group of infertile women and men did not experience a decrease in their sexual satisfaction after the announcement of their infertility condition or when they start fertility care (Ohl et al., 2009). Actually, only a small number of studies have investigated the impact of an infertility diagnosis on sexual functioning (Braverrman, 2004). A brief synopsis of some previous investigations into infertility and sexual functioning is summarized in Appendix.

Literature suggests that the differences between infertile and non-infertile subjects in sexual functioning may be also attributed to the psychological maladjustment resulting from infertility, like depression and anxiety (Marci et al., 2012). Anxiety, as a feeling of apprehension and fear characterized by physical, psychological and cognitive symptoms, plays an important role in the developing and maintenance of sexual problems (Corretti & Baldi, 2007). The same was observed in infertile population (Pakpour, Yekaninejad, Zeidi, & Burri, 2012; Saleh et al., 2003). In contrast, the constellation of symptoms associated with depression as loss of interest, reduction energy, lowered self-esteem and inability to

experience pleasure may impair intimate relationships, producing sexual problems (Baldwin, 2001). In a multicenter study with 604 infertile Iranian women, depression was found to be a strong predictor of sexual problems (Pakpour et al., 2012). Other authors have shown similar results (Kucur Suna et al., 2016; Shahraki, Tanha, & Ghajarzadeh, 2018).

Most of the research focuses on the effects women experience with infertility and do not include men, but infertility does affect both partners. When people are under stress, there is a tendency to take it out on the ones they love, specifically their partner (Rooney & Domar, 2012). Studies rarely take on a couple perspective in order to explore sexuality issues in infertility. Moreover, individuals' reaction to the diagnosis of infertility can influence partner's sexuality (Tao, Coates, & Maycock, 2011). It has been shown that female sexual function is correlated positively with male partner sexual function (Nelson, Shindel, Naughton, Ohebshalom, & Mulhall, 2008). Approximately 20% of male partners in infertile couples have elevated problems of erectile dysfunction and a decline in sexual satisfaction after an infertility diagnosis or in the presence of female sexual dysfunction (Shindel, Nelson, Naughton, Ohebshalom, & Mulhall, 2008). A study by Chevret, Jaudinot, Sullivan, Marrel, and Gendre (2004) also demonstrated the impact of male sexual function in female sexual satisfaction, indicating that female partners to men with erectile dysfunction reported significantly decreased sexual drive and sexual satisfaction when compared with those women whose partners did not have erectile dysfunction. Collier (2010) put forward the idea that the quality of the sexual function for one partner is always the main factor in determining the sexual function of the other, which either member of the couple may react with depression. Peterson, Sejbaek, Pirritano, and Schmidt (2013) have shown that severe depressive symptoms were significantly associated with increased infertility-related personal, marital and social distress in both members of the couple.

The present study intends to contribute to a better understanding of the complex influence of infertility diagnosis in the association between psychological symptoms and sexual functioning taking a dyadic approach. More specifically, this study's aim is to explore whether female and male depression and anxiety symptoms are related to either partner's sexual functioning by using a sample of couples trying to conceive with or without an infertility diagnosis and how relational outcomes vary when moderated by having knowledge of the diagnosis. Additionally, this study pretends to detect and assess to what extent couples' sexuality is affected by infertility diagnosis.

1. Method

1.1. Procedure and Participants

This cross-sectional study was approved by the Faculty of Psychology Ethical Committee for University of Porto and was conducted between July 2016 and February 2018 in Portugal. The research team invited heterosexual couples trying to conceive to participate in this study at private gynecology and infertility clinics, pre-marital courses, shopping centers and through social networks. The inclusion criteria for participation were: i. couples attempting a pregnancy; ii. women with ages between 20 and 45 years; and iii. no children with the current partner. Couples suffering from secondary infertility were excluded because this might be an influencing factor in psychological symptoms as observed in other studies (Epstein & Rosenberg, 2005).

Participants were introduced to the study's objectives and gave their consent regarding participation which was obtained from each subject prior to answering to an online questionnaire in tablets provided by the Faculty of Psychology research team or at their home, according to their preferences.

A total of 107 couples was recruited from all over the country, including the autonomous regions of Azores and Madeira. The sample is composed by two groups: the first is formed by 63 couples trying to conceive with an infertility diagnosis (diagnosed couples) and the second group consists of 44 couples trying to conceive not having knowledge of an infertility condition (not diagnosed couples).

1.2. Measures

All participants completed a battery of questionnaires measuring sexual functioning and depression and anxiety symptoms. The online surveys were developed purposefully for this study and consist of basic demographic variables (age, education level, occupation, relationship status), reproductive history and instruments previously validated to the Portuguese population.

The *Hospital Anxiety and Depression Scale* (*HADS*) is a self-administered rating instrument composed of two subscales, one measuring anxiety (*HADS Anxiety*) and another measuring depression (*HADS Depression*). The instrument consists of 14 items, seven for anxiety and seven for depression, yielding a total score, an anxiety score, and a depression score. Each item is rated on a four-point response category ranging from 0 to 3 so the possible scores ranged from 0 to 21 for both subscales. The authors indicate that a score between 0 and 7 is "normal", between 8 and 10 "mild", between 11 and 14 "moderate" and between 15 and 21 "severe" anxiety and depression (Zigmond & Snaith, 1983). The Portuguese adaptation of this instrument was used in the study, considering a cut-off point of 11 for anxiety and depression scales (Pais-Ribeiro et al., 2007). This instrument has been successfully used to identify cases of anxiety and depression disorders in subjects with a variety of diseases, including infertile women (Herrmann, 1997; Matsubayashi, Hosaka, Izumi, Suzuki, & Makino, 2001). In the validation study (Pais-Ribeiro et al., 2007), the instrument was revealed to be reliable and valid, showing similar metric properties to the original scales ($\alpha = 0.76$ for anxiety and $\alpha = 0.81$ for depression).

To evaluate sexual function, male subjects completed the *International Index of Erectile Function (IIEF)*, a 15-item self-report measure of five areas of male sexual functioning: erectile function, orgasm, sexual desire, intercourse satisfaction and overall satisfaction (Rosen et al., 1997). The questionnaire is meant to detect the possible presence and severity of sexual dysfunction, evaluating it on a 0 to 30 points score system. The score must be interpreted as severe sexual dysfunction between 0 and 10, moderate sexual dysfunction between 11 and 16, mild sexual dysfunction between 17 and 25 and no sexual dysfunction between 17 and 25. This measure allows for the calculation of a sexual function total index and a specific index for each dimension throughout the sum of corresponding items, with higher scores indicating greater levels of sexual functioning. The Portuguese version of the instrument is used and recommended for the assessment of male sexual function in both clinical and research settings, revealing a good internal reliability (Cronbach's alpha values of 0.72 and higher for all domains; Gomes & Nobre, 2012).

The *Female Sexual Function Index (FSFI)* survey was completed by female participants. The FSFI is a multidimensional 19-item instrument used to assess six domains of female sexual function: sexual desire, sexual arousal, lubrication, orgasm, sexual satisfaction, and sexual pain (Rosen et al., 2000). A computational formula was developed to obtain individual domains and full scores of the scale. For individual domains, the scores

of the individual items that comprise the domain are summed and subsequently multiplied by the domain factor, a specific value of weighting assigned to each dimension provided by the scale authors. For full scale score, the six domain scores are added. The scores for each domain range from 1.2 to 6 or from 0 to 6 and the total score ranges from 2 to 36, with higher scores indicating better levels of sexual functioning. A psychometric study supported the validity of the scale in Portuguese population (Cronbach's alpha values of 0.95 for the total scale and 0.82 and higher for all domains), encouraging its use for the assessment of women's sexual function (Pechorro, Diniz, Almeida & Vieira, 2009). According to the authors of the scale, the measure can be self-administered in research settings in different groups and it is sensitive to detect the risk of having a sexual dysfunction in participants with a score equal to or less than 26 (Rosen et al., 2000).

In this study, the scales and domains also revealed good internal reliability, with exception to "Sexual desire" and "Intercourse satisfaction" domains of IIEF (cf. Table 1).

Table 1. Cronbach's Alpha Based on Standardized Items for all scales and domains.

			Cronbach's alpha (α)
FSFI		Sexual desire	0.87
		Sexual arousal	0.86
		Lubrication	0.76
		Orgasm	0.81
		Sexual satisfaction	0.77
		Sexual pain	0.84
		Total	0.91
IIEF		Erectile function	0.88
		Orgasm	0.79
		Sexual desire	0.60
		Intercourse satisfaction	0.66
		Overall satisfaction	0.88
		Total	0.90
HADS	**Female partners**	Depression	0.81
		Anxiety	0.84
		Total	0.90
	Male partners	Depression	0.72
		Anxiety	0.80
		Total	0.84

1.3. Statistical Analysis

Data analyses were performed using the Statistical Package for Social Sciences, version 24.0 (IBM SPSS Statistics, Chicago, IL). Different types of statistical analyses were conducted, as: (1) Descriptive statistics; (2) Student's t-tests; (3) Pearson's correlations; and (4) Multiple regression analyses using the Actor-Partner-Interdependence Model (APIM; Cook & Kenny, 2005; Kenny, Kashy, & Cook, 2006) in AMOS software, version 24.0.

Descriptive analyses were determined as means, maximum and minimum, median and standard deviations to explore sociodemographic characteristics, relationship status and reproductive history, getting a picture of the distribution of sample features.

Student's T-Tests for Independent Samples were used to analyze differences between the two groups previously described (G1 "diagnosed couples"; G2 "not diagnosed couples") in socio-demographic variables and scales. Assumptions for these analyses were tested using the Kolmogorov-Smirnov, skewness, kurtosis and z-test tests. The level of significance was determined at 5%, so values greater than 0.05 were considered insignificant. *Cohen's* tests were also computed to assess the significance of the groups' differences.

Pearson's Correlations Coefficients were estimated to evaluate the relations between the variables measured on continuous scales, particularly the sexual functioning and psychological scales (anxiety and depression) of the study. Assumptions for these analyses were observed using linearity and homoscedasticity of errors.

An *Actor-Partner-Interdependence Model (APIM)* using *Structural Equation Modeling (SEM*) was implemented to assess the interdependence of observations within dyads and their interactions, measuring bidirectional effects. The *SEM* approach allows for the simultaneous estimation and testing of more than one equation, as well as the specification of the relations between parameters in different equations. The model consisted of independent and dependent variables and residual terms. Between independent and dependent variables, directional relations are executed which are called actor and partner effects. The actor effects are intra-personal effects between two variables of one person, while partner effects are interpersonal effects where one partner's variables are linked to variables of the other partner (Cook & Kenny, 2005; Kenny et al., 2006). In this study, the actor effect was the impact of an individual's depression and anxiety symptoms on their sexual functioning. The partner effect was the impact of an individual's depression and

anxiety on their partner's sexual functioning. Thus, this approach allows the analysis of dyads in one model, contributing for the hypotheses that a person's sexual functioning is related not only to one's own depression and anxiety score but also to the depression and anxiety score of their partner. This model also allows the examination of how another variable affects the size of the actor and partner effects and their interactions – *Moderating effects (APIMoM)* – by adding product terms as predictors into the main effects model. To create product terms, the depression and anxiety variables are centered and posteriorly multiplied by the moderated variable (Garcia, Kenny, & Ledermann, 2015). Therefore, we can test whether the effects between depression and anxiety scores and sexual functioning are strong or weak depending on the attribution of a diagnosis, examining the paths from product terms to sexual functioning. The adequacy of the model was evaluated using the χ^2 statistic, indicating good fit indices for values lower than 5, the comparative fit index (CFI) for values equal to or higher than 0.9, and the root mean square error of approximation (RMSEA) for values equal to or lower than 0.07 (Hooper, Coughlan & Mullen, 2008).

Because the data revealed few *missings* in each variable (0.5 to 5.6%), the model was estimated using a *Full Information Maximum Likelihood (FIML)* method to handle missing values within the analyses. Thus, it was not necessary to impute or delete *missing* values. Instead, the total of responses was divided by total questions answered.

2. Results

2.1. Descriptive results

Socio-demographic characteristics and variables associated with participants' fertility status are provided in Table 2.

Subjects were in their early thirties (30.28 ± 6.31 years) and presented a higher education level (1 = *primary school*; 2 = *second cycle*; 3 = *third cycle*; 4 = *high school*; 5 = *bachelor degree*; 6 = *undergraduate level*; 7 = *master degree*; 8 = *doctoral degree*). The total sample works for circa of 36 ± 9.97 hours a week.

Table 2. Socio-demographic characteristics and variables associated with infertility in the sample.

		Diagnosed couples (G1) (n = 63)		**Not diagnosed couples (G2) (n = 44)**		**Total (n = 107)**	
		M	**SD**	**M**	**SD**	**M**	**SD**
Age (y)		34.02	6.78	30.11	6.70	32.40	6.99
Education (1 to 8)		5.74	0.99	5.70	1.19	5.72	1.07
Workload (h)		36.88	8.53	34.58	11.70	35.93	9.97
Relationship duration (y)		9.33	5.67	7.77	4.84	8.69	5.37
Cohabitation (y)		5.19	3.76	4.56	3.35	4.95	3.60
Time trying to conceive (m)		44.13	31.61	19.23	25.09	33.93	31.49
		n	**%**	**n**	**%**	**n**	**%**
Infertility reason	**Female**	19	30.2	-	-	19	17.8
	Male	15	23.8	-	-	15	14.0
	Mixed	18	28.6	-	-	18	16.8
	Unexplained	5	7.9	-	-	5	4.7
FSFI[a]		7	11.1	6	13.6	13	12.1
IIEF[a]		1	1.6	-	-	1	0.9
HADS	**Depression**	2	3.2	1	2.3	3	2.8
	Anxiety	6	9.5	3	6.8	9	8.4

a. Dysfunction risk

Couples had been in a relationship for an average of nine years (9 ± 5.37 years) and living together for five years (5 ± 3.6 years). On average, participants were trying to conceive

for around three years (34 ± 31.5 months). Among participants who were attempting a pregnancy and diagnosed with a fertility problem, 30.2% have a female factor, 28.6% had a mixed factor, 23.8% a male factor and 7.9% unexplained.

Anxiety symptoms were present on 8.4% of the total sample (9.5% for diagnosed couples trying to conceive – G1 – and 6.8% for couples trying to conceive without a diagnosis – G2). The sample also presented reduced scores on depression: 3.2% in G1 and 2.3% in G2. 1.6% of men and 11.1% of women in G1 meet the criteria for sexual dysfunction. In couples not diagnosed (G2), men did not show any sexual dysfunction and women revealed 13.6%.

To explore the differences between the groups regarding sociodemographic and relationship related variables, we conducted *Student's T-Tests* (cf. Table 3). Almost all evaluated variables presented normal distribution, exception for age ($D(97) = .17$, $p < .001$, $Sk = -1.40$, $SD_{Sk} = .25$, $Ku = 4.27$, $SD_{Ku} = .49$). According to *Levene's test*, equality of the variances in the sample was corroborated for all variables ($p > .05$), with exception to time trying to conceive.

Results indicated differences in age [$t(104) = -2.93$; $p = .004$, *Cohen's d* = .58], with diagnosed couples trying to conceive ($M = 34.02$, $SD = 6.78$) being older than the couples from the other group ($M = 30.1$, $SD = 6.70$). Diagnosed couples were trying to conceive for a longer time [$t(101.06) = -4.49$; $p = .000$; Cohen's $d = .87$; $M = 44.13$; $SD = 31.61$] than couples who had no knowledge of a fertility problem ($M = 19.23$, $SD = 25.09$). No statistically significant differences were found between groups regarding education level [$t(104) = -.19$; $p = .849$], hours at work [$F(105) = -1.18$; $p = .242$], relationship [$t(105) = -1.45$; $p = .149$] and cohabitation duration [$t(99) = -.80$; $p = .426$].

Table 3. Statistical differences of sample features by using Student's T-tests for Independent Samples.

	t	***df***	***p***	***Cohen's d***	**Conclusion**
Age (y)	-2.93	104	**.004**	0.58	G1>G2
Education (1 to 8)	-.19	104	.849	-	-
Workload (h)	-1.18	105	.242	-	-
Relationship duration (y)	-1.49	105	.140	-	-
Cohabitation (y)	-.85	99	.395	-	-
Time trying to conceive (m)	-4.49[a]	101.06	**.000**	.87	G1>G2

Note. Significant values are depicted in **bold**.
a. Homogeneity of variance not assumed.

Clinical groups differences

In order to compare sexual function, depression and anxiety symptoms between the two groups, we statistically compared the means of both groups. Descriptive results are shown in Table 4.

According to the results from *Levene's test*, equality of the variances in the sample was corroborated for all variables ($p > .05$), with exception to the pain domain of FSFI scale and desire domain of IIEF Scale. Some scales or domains did not present normal distribution, like FSFI orgasm ($D(103) = .21$, $p < .001$, $Sk = -1.54$, $SD_{Sk} = .24$, $Ku = 2.28$, $SD_{Ku} = .47$), FSFI satisfaction ($D(103) = .28$, $p < .001$, $Sk = -1.53$, $SD_{Sk} = .24$, $Ku = 2.74$, $SD_{Ku} = .47$), FSFI pain ($D(103) = .31$, $p < .001$, $Sk = -1.75$, $SD_{Sk} = .24$, $Ku = 2.74$, $SD_{Ku} = .47$), IIEF total ($D(103) = .19$, $p < .001$, $Sk = -3.08$, $SD_{Sk} = .24$, $Ku = 14.23$, $SD_{Ku} = .47$), IIEF Erectile function ($D(103) = .31$, $p < .001$, $Sk = -4.04$, $SD_{Sk} = .24$, $Ku = 20.35$, $SD_{Ku} = .47$), IIEF Orgasm ($D(103) = .41$, $p < .001$, $Sk = -4.52$, $SD_{Sk} = .24$, $Ku = 26.63$, $SD_{Ku} = .47$), IIEF Satisfaction ($D(103) = .17$, $p < .001$, $Sk = -1.63$, $SD_{Sk} = .24$, $Ku = 5.01$, $SD_{Ku} = .47$) and IIEF Overall Satisfaction ($D(103) = .27$, $p < .001$, $Sk = -1.98$, $SD_{Sk} = .24$, $Ku = 6.26$, $SD_{Ku} = .47$).

Although the magnitude of the difference of means is considered to be small (Cohen, 1988), statistically significant differences were found between groups with respect to male sexual functioning. Significant differences were found, particularly in sexual desire [$t(99.40) = 1.99$; $p = .050$, Cohen's $d = .38$]. Thus, diagnosed men trying to conceive ($M = 8.52$, $SD = 1.22$) revealed lower sexual desire than those from the other group ($M = 8.95$, $SD = 1.02$).

The findings concerning female participants showed no significant differences in sexual functioning ($p > .05$). With regards to psychological measures in both genders, no significant difference between groups was found ($p > .05$). Therefore, all groups reported the same levels as the depression and anxiety symptoms, as well as female sexual functioning.

Table 4. Statistical differences of sexological and psychological measures by using Students' T-Test.

		G1		G2						
		M	**SD**	**M**	**SD**	***t***	***df***	***p***	***Cohen's d***	**Conclusion**
FSFI	**Desire**	4.13	1.00	4.45	.98	1.60	105	.112	-	-
	Arousal	5.03	.88	5.07	.92	.22	105	.824	-	-
	Lubrification	5.50	.65	5.43	.71	-.50	105	.621	-	-
	Orgasm	5.03	1.08	5.30	1.07	1.28	105	.203	-	-
	Satisfaction	5.43	.81	5.44	.62	.05	105	.957	-	-
	Pain	5.59	.62	5.35	.94	-1.44[a]	68.44	.155	-	-
	Total	30.71	3.73	31.04	3.89	.45	105	.657	-	-
IIEF	**Erectile Function**	28.05	3.94	28.23	3.30	.25	103	.802	-	-
	Orgasm	9.40	1.54	9.58	.93	.68	103	.500	-	-
	Desire	8.52	1.22	8.95	1.02	1.99[a]	99.40	**.050**	.38	G1<G2
	Sexual Satisfaction	12.55	2.62	12.56	2.27	.02	103	.984	-	-
	Overall Satisfaction	8.92	1.30	8.95	1.48	.13	103	.901	-	-
	Total	67.44	8.51	68.28	6.61	.546	103	.586	-	-
HADS_F	**Depression**	3.61	3.23	3.82	3.11	.33	104	.744	-	-
	Anxiety	7.44	4.14	7.86	3.71	.55	104	.586	-	-
	Total	11.05	6.95	11.68	6.33	.48	104	.633	-	-
HADS_M	**Depression**	3.55	3.06	3.49	2.84	-.10	101	.918	-	-
	Anxiety	5.80	3.34	5.84	3.39	.06	101	.956	-	-
	Total	9.35	5.56	9.33	5.53	-.02	101	.982	-	-

Note. i. Significant values are depicted in **bold**; *ii.* Higher scores on sexual function (FSFI and IIEF) are indicative of better sexual functioning
a. Homogeneity of variance not assumed.

2.2. Associations between depression, anxiety, and sexual functioning

Pearson correlations between sexual functioning, depression, and anxiety symptoms were assessed among diagnosed and not diagnosed couples. Results are shown in Table 5.

In general, female HADS scales were positively and highly correlated to all female HADS scales in both groups, while male HADS scales were positively and highly correlated to male HADS scales. Between female and male HADS scales, significantly correlations were only found in couples with an infertility diagnosis (G1). For example, female depression was positively and moderately correlated with male depression [r*(60)* = .40; *p* = .001]. Male depression was positively and poorly correlated with female anxiety [r*(60)* = .30; *p* = .010] and female total HADS score [r*(60)* = .37; *p* = .002]. Female depression was positively and poorly associated with male anxiety [r*(60)* = .27; *p* = .013] and male total HADS score [r*(60)* = .39; *p* = .001], and this one was positively associated with female anxiety [r*(60)* = .23; *p* = .041]. Furthermore, female total HADS scores were positively and poorly correlated with male total HADS scores [r*(60)* = .32; *p* = .007]. Concerning sexual functioning, the measures were only positively and poorly correlated in G2 [r*(43)* = .37; *p* = .007].

In both genders, a pattern of negative significant correlations was observed between sexual functioning and psychological symptoms, showing that the more depression and anxiety symptoms, the lower their sexual functioning. In both groups, a negative and poor association between female sexual functioning and depression and anxiety symptoms in females was found, with exception for G1 regarding anxiety ($p > .05$). Male depression was negatively and poorly associated with female and male sexual functioning, with exception to G2 ($p > .05$). The male total HADS score was negatively and poorly associated with sexual functioning in both genders in G1, but no significant associations were found in G2 ($p < .05$). Female total HADS score was only negatively associated to female sexual functioning in both groups [G1: r*(62)* = -50; *p* < .001; G2: r*(44)* = -.27; *p* = .036]. Lastly, correlations between female depression and anxiety and male sexual functioning were non-significant (*p* > .05). In general, FSFI scale was negatively and moderately related to HADS total scale in women [r*(106)* = -.40; *p* < .001], while IIEF scale was negatively and poorly related to HADS total scale in men [r*(103)* = -.27; *p* = .003].

Table 5. Pearson's correlation coefficients and mean values of the scales of sexual functioning and psychological measures.

		M	SD	1	2	3	4	5	6	7	8
1. Depression (female)	**G1**	3.61	3.23	—							
	G2	3.82	3.11	—							
	Total	3.70	3.17	—							
2. Depression (male)	**G1**	3.55	3.06	.40**	—						
	G2	3.49	2.84	.04	—						
	Total	3.52	2.96	.26**	—						
3. Anxiety (female)	**G1**	7.44	4.14	.78**	.30**	—					
	G2	7.86	3.71	.72**	-.15	—					
	Total	7.61	3.96	.75**	.13	—					
4. Anxiety (male)	**G1**	5.80	3.34	.29*	.51**	.10	—				
	G2	5.84	3.39	.07	.57**	.07	—				
	Total	5.82	3.34	.20*	.54**	.09	—				
5. HADS (female)	**G1**	11.05	6.95	.93**	.37**	.96**	.19	—			
	G2	11.68	6.33	.91**	-.07	.94**	.08	—			
	Total	11.31	6.68	.92**	.20*	.95**	.15	—			
6. HADS (male)	**G1**	9.35	5.56	.39**	.86**	.23*	.88**	.32**	—		
	G2	9.33	5.53	.07	.87**	-.03	.91**	.01	—		
	Total	9.34	5.52	.26**	.86**	.13	.89**	.20*	—		
7. FSFI	**G1**	30.71	3.73	-.47**	-.25*	-.46**	-.13	-.50**	-.22*	—	
	G2	31.04	3.89	-.37**	.01	-.16	.02	-.27*	.02	—	
	Total	30.85	3.78	-.43**	-.14	-.34**	-.07	-40**	-.12	—	
8. IIEF	**G1**	67.44	8.51	-.13	-.36**	.02	-.25*	-.05	-.35**	.16	—
	G2	68.28	6.61	.07	-.15	.11	-.08	.10	-.13	.37**	—
	Total	67.78	7.76	-.06	-.29**	.05	-.19*	.00	-.27**	.24**	—

Note. Higher scores on sexual function (FSFI and IIEF) are indicative of better sexual functioning

*. Correlation is significant at the .05 level (1-tailed); **. Correlation is significant at the .01 level (1-tailed).

2.3. Actor-Partner Interdependence Moderation Model (APIM)

An Actor-Partner Interdependence Model (APIM) was used to analyze the relationship among depression and anxiety symptoms and sexual functioning in the sample. Figure 1 depicts significant relations between sexual functioning and psychological symptoms, as well as beta values. The model had a good overall fit [$\chi^2(6)$ = 2.56, p = .862, χ^2/df = .43, CFI = 1.00, $RMSEA$ = 0.000].

None of the studied partner effects were significant, indicating the inexistence of a relation between depression and anxiety symptoms and effects on the partner's sexual functioning. However, actor effects were verified for both genders. Male and female depression symptoms were negatively associated with their own sexual functioning, respectively (men: b = -0.73; SE = 0.24; Z = -3.02; p = .003; β = -.28; women: b = -0.52; SE = 0.10; Z = -5.02; p < .001; β = -.43).

There were also important correlations in the model. Independent variables were correlated, with exception to the female anxiety with male anxiety and male depression, showed by the curved line in Figure 1. There was also a significant correlation between error or residual terms (d1 and d2), which represents the non-independence beyond that explained by the model.

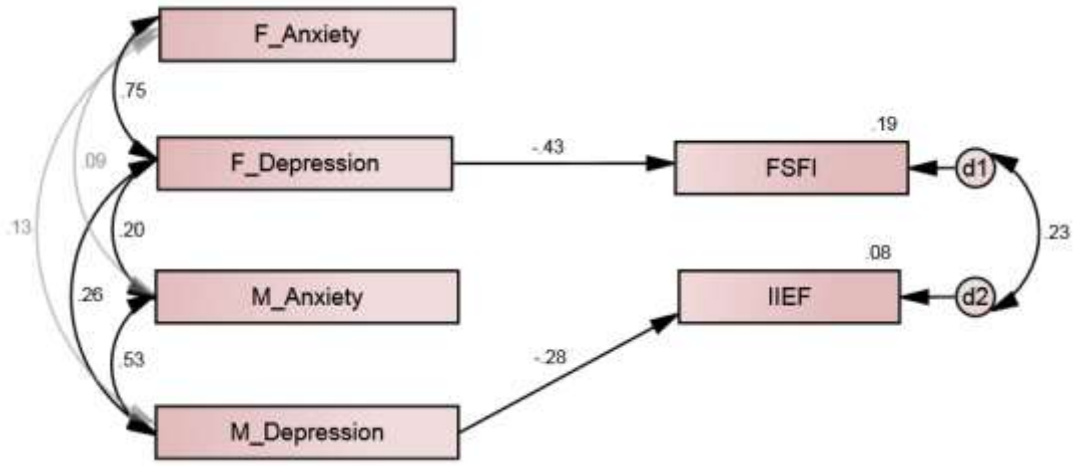

Figure 1. Actor-Partner Interdependence Model with psychological and sexological variables: final model. Observed variables are shown within rectangles, and error disturbance terms in circles. Significant values are shown in black and no significant correlations in grey. Signs of beta weights mark the direction of the effect.

The second aim was to examine the moderating effects of an infertility diagnosis, corresponding to "Diagnosis" variable, on the associations between depression and anxiety symptoms and sexual functioning, using Actor-Partner Interdependence Moderation Model (*APIMoM*). Because anxiety did not show significant effects, we excluded from the analysis (cf. Figure 2).

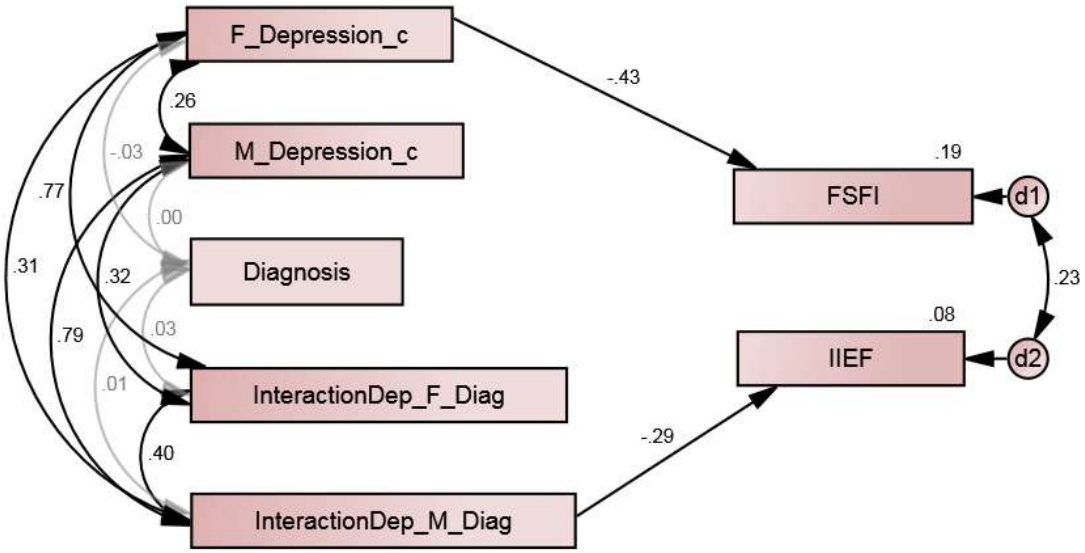

Figure 2. Actor-Partner Moderation Interdependence Model of infertility diagnosis in psychological and sexological variables: final model. Observed variables are shown within rectangles, and error disturbance terms in circles. Significant values are shown in black and no significant correlations in grey. Signs of beta weights mark the direction of the effect.

Final model results are shown in Figure 2, indicating two significant effects: (1) an actor's effect of female depression on female sexual functioning, which higher values of depression indicated worse sexual functioning on her own (b = -0.52; SE = 0.10; Z = -5.04; p < .001; β = -.43); and (2) an interaction effect between knowledge about an infertility diagnosis and male depression on male sexual functioning, suggesting that having knowledge of a diagnosis moderates the association between male actor depression and male sexual functioning. (b = -0.95; SE = 0.31; Z = -3.09; p = .002; β = -.29). The final model had a good overall fit [$\chi^2(8)$ = 2.13, p = .977, χ^2/df = .27, CFI = 1.00, $RMSEA$ = 0.000].

In what concerns moderating effects, results are illustrated in Figure 3. Considering the men trying to conceive without an infertility diagnosis, sexual functioning was shown higher in men with low levels of depression, in comparison to men with high levels of depression [$t(22.06)$ = 3.24; p = .004, Cohen's d = 1.09]. Similarly, men who are trying to

conceive having receiving a diagnosis of infertility and have high depression levels had a poorer sexual functioning score than those who have low depression levels [*t(22.06)* = 3.24; *p* = .004, Cohen's *d* = 1.09]. Results showed that receiving a diagnosis strengthens the relationship between depression and sexual functioning, suggesting that diagnosed men have worse sexual functioning if they present high depression scores.

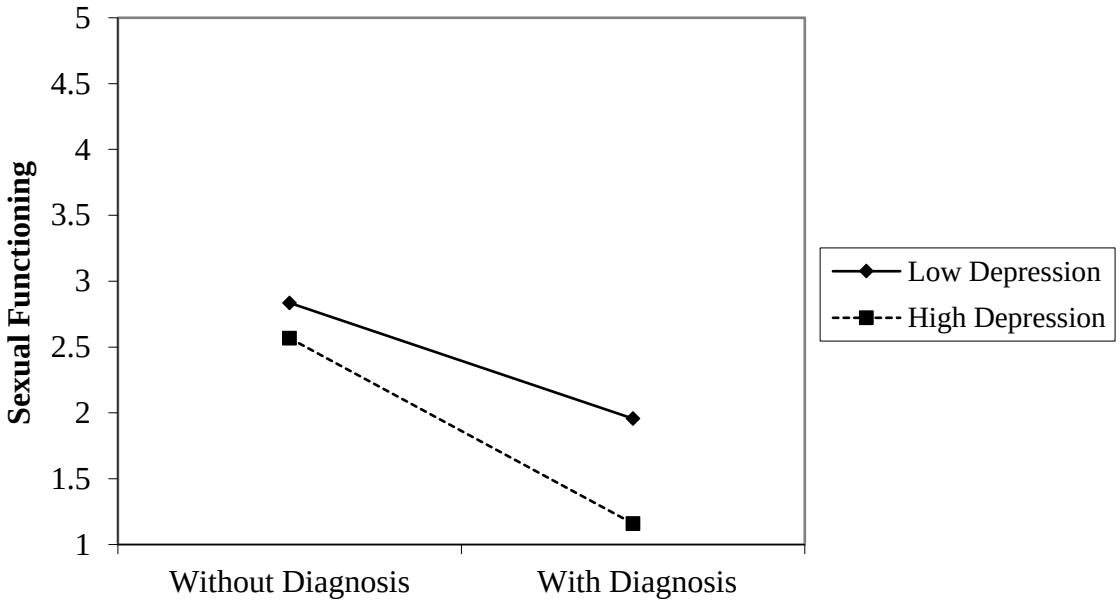

Figure 3. Moderating effects of knowledge about an infertility diagnosis between male depression and male sexual functioning (IIEF). Without Diagnosis is represented by couples trying to conceive without an infertility diagnosis and With Diagnosis represented by diagnosed couples trying to conceive.

3. Discussion

The present study sought out to explore the independent and interdependent influence of psychological symptomatology (anxiety and depression) on sexual functioning in couples attempting a pregnancy, both with and without an infertility diagnosis or knowledge of a fertility problem. This study is the first study to examine actor and partner effects of depression and anxiety symptoms on sexual functioning in a sample of couples trying to conceive including couples with an infertility condition. Additionally, using the infertility diagnosis as a moderator between psychological symptoms and sexual functioning is an important detail to better understand this relationship.

When considering depression, anxiety and sexual functioning in women, results showed that the relation between depression and sexual functioning was the strongest correlation found. This connection was the only actor effect that remained significant in the model. This finding is not surprising given that the depression appears as a risk factor for sexual dysfunction, independently of fertility status (Atlantis & Sullivan, 2012; Bodenmann & Ledermann, 2007; Montejo, Llorca, Izquierdo, & Rico-Villademoros, 2001). Results are in line with those of community-based infertility studies showing that depression predicts poorer sexual functioning (Pakpour et al., 2012; Kucur Suna et al., 2016; Shahraki et al., 2018).

Contrarily to other studies (Berg & Wilson, 1991; Oddens, den Tonkelaar, & Nieuwenhuyse, 1999; Pakpour et al., 2012; Saleh et al., 2003; Sultan & Tahir, 2011), significant associations between anxiety and sexual functioning were non-significant, both in women and in men. This does not mean that anxiety does not influence sexual functioning. According to Laurent and Simons (2009), anxiety affects sexual functioning in diverse ways for different people. Kaplan (1979) explained that anxiety inhibits the autonomic nervous system response preventing sexual reaction. However, people with a good autonomic nervous functioning can experience sexual arousal as a response to threat. This can partially be due to personal history. Laurent and Simons (2009) have shown that people with a history of sexual problems were less likely to experience sexual response. Contrarily, without a history of sexual dysfunction, anxiety sometimes increased sexual arousal. These findings can be explained by thoughts and sexual expectations, given that cognitive interference plays

a major role in sexual dysfunction (Barlow, 1986). In this study, the non-significant results might be because of this ambivalence in sexual function overall. For this reason, personal and medical history should be included in future studies, as well as sexual expectations.

When adding the diagnostic and the interaction in the equation, the main effect of depression in male sexual functioning was no longer significant. According to the dynamic model of male erectile dysfunction (Araujo, Durante, Feldman, Golstein, & Mckinlay, 1998), the relationship between depression and erectile dysfunction is multifactorial, which can facilitate or prevent the impact of one condition on the other. For example, age, health status, medication, interventions (e.g. depressive or sexual treatment) and level of physical activity can reduce the effect of depression on erectile dysfunction. The same can be seen in depression and anxiety symptomology and sexual functioning in general.

In effect, interaction analyzes suggest that male depression only has an effect on individual reports of sexual functioning in men in couples that were diagnosed with a fertility problem. As a conclusion, this may reflect the importance of having a diagnosis to the impact of depression on sexual functioning. Previous studies confirm that depression was associated with reduced sexual functioning in infertile population (Czyżkowska et al., 2016; Millheiser et al., 2010). Eventually, sexual information which is processing in the brain and neurotransmitters that modulate sexual response could be compromised due to depression and consequently inhibited motivation for sexual interaction (Basson & Gilks, 2018). Nevertheless, greater experience of depression may cause a more accurate perception of the sexual problems caused by depression and hence may be likely to report an increase in positive aspects of sexuality (Bancroft et al.,2003). This perception can be affected by infertility diagnosis, altering the judgment and turning depression into a negative factor of sexual functioning. This can explain the slight difference of sexual functioning according to depression status found between diagnosed and not diagnosed men. It is also important to note that some couples were seeking fertility treatments, that could strictly restrict sexual intercourse to a specific schedule and aim directly to a pregnancy. As a result, a person's mood could be affected and recreative and erotic value of sexuality deprived (Cousineau & Domar, 2007). These results highlight the importance of including psychological treatment in sexual interventions.

In this study, partner effects were not found. Bodenmann and Ledermann (2007) have shown that sexual functioning of one person is independent of the depression status of the other person. Furthermore, the correlations already indicated a weaker or lack of

association between sexual functioning and partner's psychological symptoms. These results support the findings of previous authors that sexual functioning was not correlated with partner's depression, only with partner's sexual functioning (Nelson et al., 2008; Shindel et al., 2008).

Concerning psychopathology and sexual dysfunction, no statistically significant differences were found in all scales and domains between couples with and without an infertility diagnosis, with exception to sexual desire of male sexual functioning. These findings add to the existing literature by suggesting that the sexual desire of these individuals seems to be affected by infertility (Marci et al., 2012; Purcell-Lévesque, Brassard, Carranza-Mamane, & Péloquin, 2018). This result can be due to the progressive transition from recreative to procreative sex, declining the erotic power of sexual intercourse. Moreover, women turn pregnancy to their principal and unique aim of life and become responsible for most infertility aspects (Cousineau & Domar, 2007), including sexuality. In turn, the absence of effects in the other dimensions and in sexual function total scored may be primarily accounted for by two reasons. First, this study was centered on having received a diagnosis-related to a fertility problem. These results might differ if we considered time trying to conceive, given that it might be the fact that diagnosed couples are trying to conceive for a longer time that potentially decreases sexual function when men are depressed and not receiving a diagnosis of infertility per se. The second reason can be associated with cultural factors, which play a large role in the experiences individuals or couples in infertility. The paradigm has been changing across the time in more developed countries including Portugal, since the reproductive technologies progress offers hope to couples assuaging social pressure and cultural influences (Cousineau & Domar, 2007; Rooney & Domar, 2012). In fact, Portuguese couples have shown optimistic perceptions of achieving a pregnancy (Almeida-Santos, 2017) and hence, social influences could have reduced impact on infertility-related distress, including sexual functioning.

The frequency of sexual and psychological problems was also examined. In the complete sample, the rates of psychological symptoms were, on average, 8.4% for anxiety and 2.8% for depression. These percentages are relatively small when compared to previous studies (Furukawa, Patton, Amato, Li, & Leclair, 2012; Oddens et al, 1999; Pakpour et al., 2012). Results also revealed reduced rates of sexual dysfunction: 12.1% for FSFI and 0.9% for IIEF. The occurrence of sexual problems in this sample enhance the diverse inconsistent percentages found in other samples of couples (cf. Appendix). Some of this discordance may

be due to means of assessing anxiety, depression and sexual functioning, cultural factors, coping strategies, and social desirability bias.

This study has several strong characteristics including a valuable starting view on sexual functioning in infertility couples. This is the first study to investigate the relationship between psychological symptoms and sexual functioning in Portuguese infertile couples using a dyadic approach. Overall, this study highlights the impact of infertility diagnosis on male sexual functioning and hence the need for inclusion of both members of the couple in infertility and sexuality approaches, mostly in clinical practice. The use of a group differentiation by diagnosis knowledge may bring a different view to the factors and consequences of infertility. Additionally, this study provides a better understanding of the relation between depression, anxiety, and sexuality in the context of infertility by using validated measures.

This study has some important limitations that must be mentioned. First, the cross-sectional design of this study does not permit assumptions about the causality of the data. Second, the sample size was relatively small, which might affect the reliability of the results. Even though the sample size is comparable to that of previous studies (e.g. Berg & Wilson, 1991; Marci et al., 2012; Nelson et al., 2008; Shindel et al., 2008), it could have prevent us from finding other statistically significant results. Third, the utilization of rating scales and self-administered questionnaires may have many drawbacks, as well as benefits. One disadvantage is that some persons may lack insight or recall into their conditions, lack of trust on anonymity and shame. For this reason, it is possible that they underestimated their problems. The second disadvantage was associated with the need for further evaluation to better understand the psychological and sexological problems. Fourthly, the study does not include couples with children and couples in homosexual relationships. In addition, other factors were not assessed in the model, like age, time trying to conceive, relationship duration, personal and medical history, and infertility duration which can act as possible confounders. Finally, differential analyses according to diagnosis etiology were not included in this study. It is possible that results and interpretation would be different when controlling for infertility causality. All these limitations must be taken into consideration when generalizing and interpreting the results of this study.

Future studies should further execute more analyses on sexual functioning to advance psychosocial and counseling intervention that target the infertile dyad. Because no previous research has investigated the moderation effects of infertility diagnosis between

psychological symptoms and sexual functioning, the study must be replicated addressing longitudinal data, mixed approaches and other important variables mentioned above. The findings also need to be replicated in a population with reduced levels of education and higher levels of psychological and sexological problems, as the results may vary. Likewise, it will be interesting to replicate this study with homosexual couples and with specific domains of sexual functioning. Given the male effects and female actor results, the couples can benefit from receiving psychological and sexological therapy. It might also prove helpful for healthy professionals to strongly encourage the involvement of both members of the couple in the treatment process and to clarify patients about infertility consequences and sexual expectations.

4. Conclusion

To summarize, the present study shows that sexual functioning can be related to depression symptoms and infertility diagnosis. The main findings underline the impact of infertility diagnosis in impairing male sexual functioning in the presence of high levels of depression and highlight the role of depression in sexual functioning in the female sample. Additionally, diagnosed infertile men reported lower sexual desire levels in comparison to men without a diagnosis.

This study highlights the importance of including sexuality in the infertility context, alerting health professionals to the relevance of considering a holistic approach to infertility in order to help couples who come across this unexpected life aggravation and to restore the spontaneity of sexuality. The research also reinforces the need for the involvement of the male partner in the treatment process and in infertility counseling. Future research focusing on the psychological effects on sexual functioning on infertile couples and on the personal history and sexual expectations of the couples would be valuable in expanding the current knowledge base.

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Appendix

Summary of studies talking about sexuality in infertility

Author (year)	Country	Sample	Measures[a]	Results/Conclusions[b]
Amiri et al. (2016)	Iran	1017 presumably fertile women 511 infertile women	Larson Sexual Satisfaction Scale	No statistically significant difference was observed in sexual satisfaction; They concluded that fertility problems do not lead to lower sexual satisfaction.
Anderson et al. (2003)	Scotland	113 infertile couples (Time 1) 64 infertile couples (Time 2)	HADS, specially designed questionnaire	Concerns about sexuality just found in women; Correlation between total concern and depression, but not anxiety; Women more affected than men.
Berg & Wilson (1991)	Kentucky, United States	104 couples with primary infertility	SCL-90-R, Sexual Function	Sexual relationship adequate during the first stage of medical investigation for infertility and less affected by the pressures of diagnosis and initial treatment regimens; Indices of sexual satisfaction were at the lowest overall level; Depression symptoms, anxiety and interpersonal discomfort were evident and higher during the first stage.
Czyżkowska et al. (2016)	Poland	50 infertile women 50 presumably fertile women	SSS, Mell-Krat Scale, BDI	Risk of sexual dysfunctions, lower levels of sexual satisfaction (physical, emotional and satisfaction with control) and sexual reactivity, and higher values of depression were revealed by infertile women.
Drosdzol & Skrzypulec (2009)	Poland	206 infertile couples 190 presumably fertile couples	IMS, ISS	No significant differences in marital sexual relationship in women; No significant differences in intimate conjugal relationship in men; Male factor related to higher relationship instability and lower intimate life satisfaction; 14.08% of infertile participants are undiagnosed.
Furukawa et al. (2012)	Oregon, United States	75 infertile women 210 presumably fertile women	FSFI, PHQ-9, original questions about sexual pain	The rates of both dyspareunia (30.7%vs.37.6%) and sexual dysfunction (37.3%vs.31.9%) were similar in both groups;

Author (year)	Country	Sample	Measures[a]	Results/Conclusions[b]
				No significant association between dyspareunia or sexual dysfunction with infertility; More frequent intercourse and higher satisfaction in infertile women.
Galhardo et al. (2011)	Portugal	80 presumably fertile couples 80 infertile couples (treatment) 40 infertile couples (adoption)	BDI, FSFI, IIEF, Intimacy dimensions	No significant differences in sexual functioning between the three groups; Frequent depression symptoms in infertile couples looking for treatment, while the other groups didn't significantly differ.
Khademi et al. (2008)	Tehran, Iran	100 infertile couples	SFQ, IIEF	7% of women in normal range on sexual function scores; More sexual dysfunctions on arousal sensation and less problems of orgasm; 38.4% of men in normal situation in erectile function; Infertility more associated to mild to moderate erectile dysfunction.
Kucur Suna et al. (2016)	Turkey	142 infertile women	FSFI, BDI	43.3% of sexual dysfunction risk in infertile women with female factor, 54.8% in male infertility group and 51.9% in unexplained infertility; No significant difference in sexual functioning among the groups; No significant differences in depression between the groups.
Laffont & Edelmann (1994)	France	101 infertile men 117 infertile women	GHQ 28	Worse spontaneity for 25% of men and 33% of women; Lower frequency of intercourse for 34% of men and 31% of women; Decreased of partner's libido for 40% of males and 14% of females.
Marci et al. (2012)	Italy	30 recently diagnosed infertile couples; 30 infertile couples in treatment;	IIEF, FSFI	Men: G1 had 26.6% of erectile dysfunction, lower scores in all subscales compared to G3 and lower score just in erectile function compared to G2 (6.66% of erectile dysfunction); G2 had lower scores on desire, sexual satisfaction, and overall satisfaction compared to G3.

Author (year)	Country	Sample	Measures[a]	Results/Conclusions[b]
		52 presumably fertile couples.		Women: G1 with lower scores for orgasm, arousal, lubrication, and sexual satisfaction compared to G3, but no significant differences with G2; G2 with lower scores in all subscales compared to G3.
Millheiser et al. (2010)	California, United States	119 infertile women 99 presumably fertile women	FSFI, frequency of sexual intercourse, masturbation and sex-life satisfaction	Infertile women with 40% of risk for sexual dysfunction (vs. 25% in control group), lower scores in desire, arousal, sex-life satisfaction, frequency of intercourse and masturbation, and similarly sex-life satisfaction before their diagnosis compared to the controls.
Nelson et al. (2008) and Shindel et al. (2008)	Northeast and Midwest regions of the United States	121 infertile couples	CES-D, SF-36, FSFI, IIEF	22% of erectile dysfunction in men and 26% of high risk of sexual dysfunction in women (mainly desire, arousal, orgasm, and satisfaction); Female sexual functioning associated to depression and to male sexual functioning; Male sexual function negatively associated with risk for female partner sexual dysfunction, and female sexual dysfunction as a positive predictor of erectile dysfunction in the male partner.
Oddens et al., (1999)	France, Belgian and German	281 infertile women 289 presumably fertile women	Women's Health Questionnaire	Infertile women with 24.9% of depression (vs. 6.8% in control group), lower frequency, spontaneity, satisfaction, interest and pleasure, and less favorable scores on depression and anxiety.
Ohl et al. (2009)	France	114 infertile women 101 infertile men	Original questionnaire	Majority of patients were satisfied with their sex life and didn't experience a decrease in their sexual satisfaction after the announcement of their infertility or when they were receiving fertility care.
Oskay et al. (2010)	Turkey	308 infertile women 308 presumably fertile women	FSFI	Infertile women with 61.7% of risk for sexual dysfunction (vs. 42.9% in control group), lower scores in FSFI and lower frequency of intercourse;

Author (year)	Country	Sample	Measures[a]	Results/Conclusions[b]
				Infertile women who having intercourse just for getting pregnant (46.4%) with lower arousal, lubrication, orgasm and total FSFI scores; Infertile women who present a sexual problem in the male partner showed lower scores in all FSFI scores except pain.
Pakpour et al. (2012)	Iran	636 infertile women	FSFI, HADS, SF-36	56% of infertile women with risk for sexual dysfunction; Secondary infertile women with lower scores in all FSFI scales in comparison with primary infertile women; Women with higher anxiety and depression had more sexual problems; Depression as a strong predictor of sexual problems;
Purcell-Lévesque et al. (2018)	Canada	45 infertile couples (88 women, 45 men)	Short Experiences in Close Relationships Scale, Arizona Sexual Experiences Scale, Global Measure of Sexual Satisfaction	14.8% to 58.0% of sexual problems in women and from 6.7% to 28.9% in men (mainly desire and arousal problems); Attachment-related anxiety positively predicted erectile and orgasm difficulties in men and lubrication problems in women; Attachment-related avoidance was related to greater sexual pain, lower sexual satisfaction and difficulty to achieve an orgasm.
Saleh et al. (2003)	Indian	412 infertile men with primary infertility	IIEF-5	11% with erection or orgasm problems after detection of an abnormality in the results of their first semen analysis; Erectile dysfunction as the cause from its association with a longer duration of infertility and with increased levels of anxiety.
Shahraki et al. (2018	Iran	115 infertile women 78 women with primary infertility	BDI, FSFI, SQOL-F	No significant differences were found in sexual functioning between infertile women and healthy ones; Depression was significantly lower in healthy individuals and higher in individuals with sexual dysfunction;

Author (year)	Country	Sample	Measures[a]	Results/Conclusions[b]
		71 women with secondary infertility		Depression and sexual dysfunction were independent predictors of sexual quality of life; Individuals with primary infertility suffered more from sexual dysfunction, while depression was significantly higher.
Slade et al. (1992)	The United Kingdom	47 couples with primary infertility (Time 1) 28 couples with primary infertility (Time 2)	MACL, GRISS	No difference was evident at initial assessment; Frequency of intercourse was significantly reduced for men and women; No significant impact on anxiety and depression in women 3 years later; Men in couples continuing to be infertile 3 years later showed significantly more depressive and anxious.
Sultan & Tahir (2011)	Pakistan	200 presumably fertile couples 200 infertile couples	BDI, BAI, ISS	Infertile couples with higher levels of depression and anxiety and lower levels of sexual satisfaction, as compared to fertile couples; Age as a significant factor for sexual satisfaction.
Wright et al. (1991)	France	449 infertile couples	Index of Psychiatric Symptomatology, Index of Sexual Satisfaction	Infertile women with more psychosocial distress than their partners; Causality of infertility with little impact on psychosocial functioning; Infertile couples reported with few sexual problems.
Zare et al. (2016)	Iran	110 infertile women 110 presumably fertile women	GRISS-F1	No significant differences were found in sexual problems between the groups; In infertile women, the most sexual problems related to non-relationship and in fertile women to non-frequency; In infertile women, most sexual disorder related to non-communication and in fertile women to infrequency.

a. Relevant measures for the results and conclusions referenced;
b. Relevant conclusions for the present study.